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## A verified sliding window protocol with variable flow control

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### ↑ ABSTRACT

We present a verified sliding window protocol which uses modulo- $N$  sequence numbers to achieve reliable flow-controlled data transfer between a source and a destination. Communication channels are assumed to lose, duplicate and reorder messages in transit. The destination's data needs are represented by a receive window whose size can vary with time. The destination entity uses acknowledgement messages to inform the source entity of the current receive window size and the sequence number of the data word next expected. The source entity responds by sending segments of data words that lie within the allowed window. Each data segment is accompanied by an identifying sequence number and the size of the data segment. The destination entity also uses selective acknowledgement and selective reject messages to inform the source entity of the reception or lack of reception, respectively, of out-of-sequence data segments. Thus, this protocol is a proper extension of the Arpanet's TCP. We have obtained the minimum value of  $N$  that ensures correct data transfer and flow control, in terms of the minimum message transmission time, the maximum message lifetime, and the maximum receive window size. The protocol imposes no constraints on the retransmissions of messages or on the data segment sizes; thus, any retransmission policy that optimizes the protocol's performance can be used.

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#### ↑ INDEX TERMS

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